Flightfax

ARMY AVIATION RISK-MANAGEMENT PUBLICATION

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There appears to be a killer stalking Army aviation. When it strikes, pilots are unable to see, believe, interpret, or process the information on their flight instruments. Instead, they rely on false information their senses provide, becoming victims of

SPATIAL Disorientation

Tracking down a killer

While flying 30 to 60 feet agl during an NVG training mission, an OH-58 PC perceived that he had more than 10 feet of clearance from the sand dune to his front. He was in fact below the crest of the sand dune and flew into it.

Luckily, neither he nor his copilot was seriously injured, but the aircraft was destroyed and a combat asset was lost during training in a combat theater of operations—Desert Shield/Desert Storm (DS/DS). Investigators attributed this accident to human error due to lack of training in the desert environment, which provides little or no visual cues to assist flight crews with obstacle clearance.

This accident would, in time, contribute to a growing concern that spatial disorientation (SD) was playing a far greater destructive role in helicopter operations than had been previously suspected. As Army aerospace-medicine specialists reviewed report after report of accidents in DS/DS, they became more and more concerned. Was SD a problem unique to the Southwest Asia theater of operations, or was it a problem inherent in modern-day operations requiring aircrews to fly faster and more complex missions under higher-risk conditions?

A review by the Army Safety Center surgeon in 1993 compared Class A accidents (noncombat) in the DS/DS theater of operations to a baseline timeframe 1 year before. This review showed the following:

Item of comparison	DS/DS timeframe (1 Aug 90 - 11 Apr 91)	Baseline timeframe (1 Aug 89 - 11 Apr 90)
Class A acdt rate*	14.87	2.24
Fatality rate*	11.28	2.54
SD a major factor	66% (19/29)	43% (10/23)

*Per 100,000 flying hours

This review was the first true indication of the magnitude of the SD hazard in Army helicopter operations. It also suggested (but did not confirm) the possibility that accidents involving SD tend to cost more both in injuries and damage than those not involving SD. More important, these results directly contradicted those of previous studies that indicated downward trends in SD-related accidents during the 30 years from 1957 through 1987.

The exact magnitude of the SD hazard and its direct link to increased fatalities would come as the result of a study[1] conducted jointly by the U.S. Army Aeromedical Research Laboratory (USAARL) and the U.S. Army Safety Center (USASC). Published in June 1995, this study of Class A-C Army helicopter accidents during the 5-year period 1 May 1987 through 30 April 1992 found that—

- Spatial disorientation was a major factor in 32 percent of the accidents.
- The 32 percent that involved spatial disorientation accounted for a disproportionate 60 percent of the fatalities and 52 percent of the cost of the accidents. This finding supported the notion that loss of orientation tends to lead to a more-catastrophic outcome in modern-day operational flight profiles.
- Mechanisms most commonly associated with SD accidents included misjudgment of clearance to the ground or terrain obstacle (65%); aircrew distraction (44%); and brownout, whiteout, or inadvertent entry into IMC (25%). (Some accidents involved more than one mechanism.)

A key human-performance observation made in the report was that: "The typical picture is . . . one of a hard-pressed aircrew, flying a systems-intensive aircraft under NVD, failing to detect a dangerous flight path." A direct implication of this observation is that some of the flight profiles being flown in current operations keep aircrewmembers on a razor's edge from losing situational awareness. This edge is lost when fractured by spatial disorientation or other human, environmental, or materiel factors.

This study clearly delineated the role that SD had played in Class A-C helicopter accidents over a 5-year period. However, focusing on accident results looks only at worst-case scenarios. The next logical issue was to address the frequency of SD in aviation operations overall, not just in those resulting in an accident. To determine the possible role of SD in current aviation operations, USAARL surveyed 299 pilots, all of whom were currently flying at five Army airfields. Results of this survey were published in May 1996[2] and included the following:

- 78% of the pilots surveyed had experienced SD during their flying career.
- 22% had experienced SD in the previous 4 months.
- 33% reported that the mission was adversely affected.
- 2% reported that the mission had ended in mishap.
- 44% had experienced the "leans."
- 13% had experienced brownout, whiteout, or inadvertent entry into IMC.

Some survey observations provided compelling arguments for the need to develop and implement controls for spatial-disorientation-related hazards. The observations included the following:

- Flying experience, whether measured by flight hours or by pilot designation (aviator, senior aviator, master aviator), did not appear to offer protection from SD.
- Having two pilots is not sufficient protection against SD; in 40 percent of NVG episodes, both pilots experienced SD simultaneously.
- In 43 percent of reported worst-ever episodes, pilots were not immediately aware of having SD.
- In 60 percent of worst-ever episodes, pilots were focused on the flight instruments. (This observation is not a negative critique of instrument flying, but emphasizes the adverse effect of channeling attention.)

These observations raised the argument that, because SD is physiologically based, it may require a technological fix, not simply a training fix. In other words, some of our flying profiles are exceeding the limits of human sensory systems; therefore, some aspects of flight must be controlled by technology, not by the aviator (i.e., automatic pilot, hover lock, etc.).

A followup study[3] extending the timeframe of the original study another 3 years (through 1995) showed only minimal improvements in the SD impact on rotary-wing operations:

Category	1987-1992 (5 years)	1987-1995 (8 years)
SD a major factor (of all Class A-C)	32%	30%
Avg annual SD fatalities	15.6	13.8
Avg annual SD cost	$61.8 M	$58.5 M

These studies had made it clear that spatial disorientation poses hazards and high risks to Army helicopter operations, and the cost is high. The challenge then became to start identifying and implementing controls for the hazard.

The first step was to clarify the operational definition of spatial disorientation. FM 1-301: *Aeromedical Training for Flight Personnel* (1987) defined SD as "an individual's inaccurate perception of position, attitude, or motion.... When it occurs, pilots are unable to see, believe, interpret, or process the information on the flight instruments. Instead, they rely on the false information their senses provide." In view of current mission profiles that include multi-ship operations, this definition was expanded for the purposes of this study to include an aircrewmember's inaccurate perception of position, attitude, or motion ***relative to another aircraft.*** The definition does not include instances in which an aircrewmember is geographically disoriented (or, just simply, lost); however, it does not exclude circumstances when being lost contributes to an SD situation developing as a subsequent event.

Given this operational definition of SD, the next logical question was: Why has SD become such a problem in helicopter operations at this point in time? Several theories have been proposed. The two that seem to be most valid based on the results of recent studies are these:

- Technology continues to compress the time in which the aircrew can be given input while increasing the amount of input they're given. Consequently, aircrewmembers must sort and process more information in less time, which can result in sensory overload that leads to spatial disorientation. If this happens in *training*—and we know that it does, the increased sensory input during *combat* will make SD even more likely.
- Closely related to sensory overload is the theory that the profiles currently being flown already exceed the human physiologic design for processing sensory input. Today's routine mission profiles demand more than human beings are designed to do. Army aviators are asked to fly faster, lower, longer, in the dark, in weather, in formation, and under goggles. More often than not, they're asked to do all this at the same time. And, oh, by the way, somebody may also be shooting at them. This level of complexity is further increased by the frequency and amount of real-time information technology is giving them during flight. It comes, then, as no surprise that they're experiencing SD, yet not sensing or realizing it before reaching the point at which it's too late to react.

If we are to accept these theories, one of the implied solutions may be difficult for Army aviators—who for so long have been in control of every aspect of flight—to accept. That is, to accept technology that will enable the aircraft of the future to fly itself (i.e., hover lock, position-holding devices, automatic pilot), freeing pilots to be concerned solely with tactical considerations.

Having defined and identified the hazard posed by SD, the foundation had been laid to discuss what controls need to be applied to this hazard to eliminate—or at least reduce—SD-related risks. To this end, a tri-service Spatial Disorientation in Rotary Wing Aviation Conference was held at Fort Rucker in September 1996. What resulted were proposed SD controls in four major categories:

- **Education.** These controls involve initiatives to increase awareness of spatial disorientation and to improve SD documentation and data collection.
- **Training.** These controls involve the review and updating of current training to incorporate what is now known about the SD hazard.
- **Research.** These controls were divided into near-, mid-, and long-term initiatives to continue the research momentum to further define the SD hazard and test effective technologic controls.
- **Equipment.** These controls emphasize the need to look at current off-the-shelf technologies developed to address spatial disorientation and to develop future technologies to control it.

A future *Flightfax* article will outline details of the specific controls in each of the four categories.

Summary

The FY 96 rate of 0.65 Class A aviation accidents per 100,000 flying hours is evidence of the dedication and effectiveness with which aircrewmembers are applying risk management in flight operations. However, among the seven Class A accidents in FY 96 were two midair collisions, one tail-rotor strike, and a high-G ground impact during IMC. That four of the seven accidents might have involved some degree of "...an individual's inaccurate perception of position, attitude, or motion..." begs the question of whether the problem is being sufficiently addressed in rotary-wing aviation.

Spatial disorientation plays an undeniable role in the loss of situational awareness in Army rotary-wing operations. It is clearly a hazard that requires more focus if application of our risk-management process is to continue to drive our accident rate down.

—COL Edwin A. Murdock, MD, MPH, U.S. Army Safety Center Surgeon, DSN 558-2763 (334-255-2763)

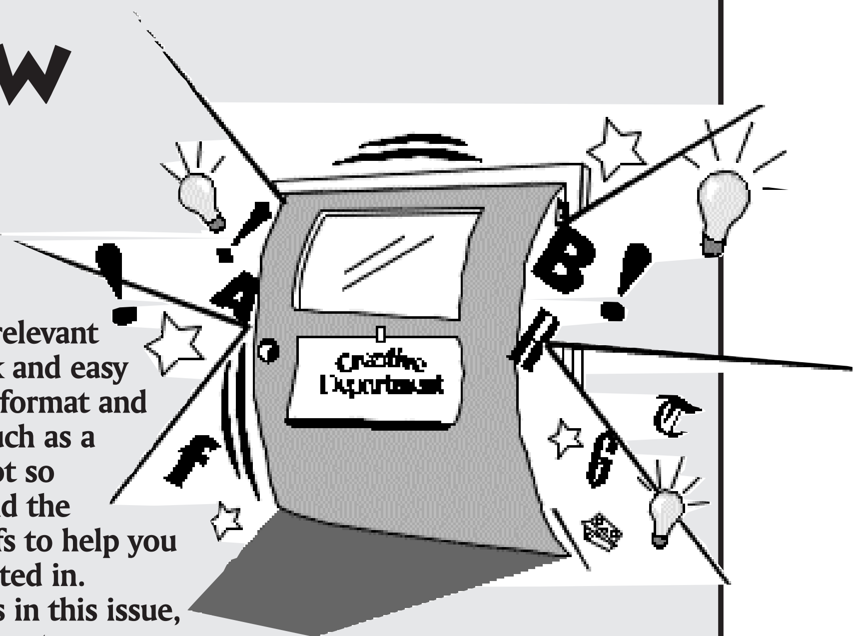
References

[1]Durnford, S.J., J.S. Crowley, N.R. Rosado, J.P. Harper, and S.L. DeRoche. *Spatial Disorientation: A Survey of U.S. Army Helicopter Accidents, 1987-1992*. USAARL Report No. 95-25, June 1995.

[2]Durnford, S.J., S.L. DeRoche, J.P. Harper, and L.A. Trudeau. *Spatial Disorientation: A Survey of U.S. Army Rotary Wing Aircrew*. USAARL Report No. 96-16, May 1996.

[3]Braithwaite, M.G. *A Review of U.S. Army Helicopter Accidents, 1987-1995*. Personal Communication, USAARL (to be published).

WHAT'S NEW WITH FLIGHTFAX



In our continuing efforts to keep Flightfax relevant to your needs and interests as well as quick and easy to read, we've made a few changes in both format and content. Some of the changes are subtle, such as a new, more readable typeface. Others are not so subtle, such as the redesigned masthead and the use of graphic symbols in the accident briefs to help you quickly find the aircraft you're most interested in.

We're also introducing two new columns in this issue, the success of which will depend on your input.

"Crew Commo" (page 6) is intended to give aircrews—and other aviation personnel, for that matter—an informal forum in which to communicate with us and each other. We hope to hear from all of you—including maintenance personnel—on issues regarding safety and risk management in Army aviation.

Because the cost of accidents is paid in lives, dollars, and readiness, we cannot afford to learn every lesson first-hand; we must learn from others' experience whenever we can and share what we know with each other. That's the idea behind "War Stories" (page 7). The purpose of this new feature is to provide a way for the entire Army aviation community to learn from each others' mistakes and to share how risk management is being integrated into real-world Army aviation operations.

But all is not new in *Flightfax*. You'll also continue to see—and, we hope, contribute to—the old familiar columns: *ASO Talk, STACOM, ShortFax, Broken Wing Awards,* and *Food for Thought*.

The Army Safety Center is dedicated to the concept of protecting the force through risk management, and our goal is to make it easy for our readers to contribute to that effort. Just a couple of notes so everybody understands the deal:

■ Space in *Flightfax* is limited, so we ask that you be as brief and to the point as possible.

■ We won't be publishing items that are submitted anonymously, but we will keep your identity confidential if you say so.

■ If we edit your input for length or clarity, we'll get your approval before publishing the revised version.

You can contact us in a number of ways:

■ Phone: DSN 558-2676 (334-255-2676)

■ Fax: DSN 558-9478/3743 (334-255-9478/3743)

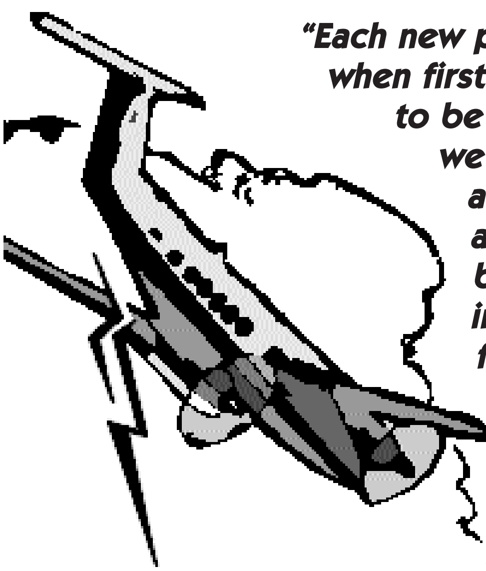
■ E-mail: flightfax@safety-emh1.army.mil

■ Mail: Commander, U.S. Army Safety Center, ATTN: CSSC-RSA (*Flightfax*), Bldg. 4905, 5th Ave., Fort Rucker, AL 36362-5363.

Please let us know how we can help you. We truly want to know how we can serve you better. And we look forward to working with you as you contribute to Army aviation safety through *Flightfax*.

On recklessness and skill

Your cover story ["Recipe For Disaster"] in the November 1996 *Flightfax* reminded me of an article I read 2 years into my Army aviation experience in 1984. It was about a stunt pilot who repeatedly exceeded Ve 5 to 10 knots while performing inside loops in a twin-engine commuter plane. He exceeded Ve for the last time when both wings broke during an inside loop at a show that, ironically, his fiancée was announcing. The aircraft was destroyed, and he was killed. I think this excerpt from the article says it all:



"Each new plateau of risk, when first attained, seems to be the last; but, as we grow accustomed to it, a new horizon beckons. What insulates us from fear as we approach the danger is simply habit, the familiarity of a point we have reached and all the points we've left behind. Until one steps too far, it's often hard to tell the difference between recklessness and skill."

—MAJ Chris Miller, Aviation Systems, Air Delivery Branch, Yuma Proving Ground, AZ 85365-9110, DSN 899-6530 (520-328-6530)

More about the weather

We enjoyed "About the Weather. . ." in the November 1996 *Flightfax*. I would like to contribute these comments on weather calls and mission accomplishment.

Our mission is to provide 24-hour, all-weather helicopter transport for a senior unified commander. When tasked to provide transport to our customer, we not only perform the detailed mission planning required by regulatory guidance, we consider the customer's mission and the impact his presence has on world affairs. When we accept a mission, we are assuring that we can transport him to his destination safely and on time. Because of his robust and demanding schedule, our customer can ill afford to miss or be late for important military or political gatherings in which many policies/decisions depend upon his presence. When weather conditions require IFR flight, our procedures require us to ensure destination weather minimums do not require the use of an alternate airport, which would delay or cancel the customer's schedule.

If an alternate is required and time is critical, we recommend that ground transportation be used to ensure the customer arrives at his destination on time. When we accept a mission and execute to standard, we take a great amount of pride in mission accomplishment. However, if we have to cancel or recommend ground transportation, we take an equal amount of pride in knowing our customer arrived at his destination safely and on time.

Prior to every flight, all units, regardless of type, must use the risk-management process to ensure the weather is more than just legal. This process is designed to facilitate the decision-making process. If the benefits of performing the mission do not significantly outweigh the inherent risks of marginal/borderline weather, the customer is best served by being advised to implement alternate transportation to ensure safe mission accomplishment. An age-old sense of urgency associated with many aviation support profiles—to launch in marginal weather—has been the recipe for far too many aircraft mishaps.

Following these or similar guidelines will result in a higher mission-accomplishment rate, a lower weather-related mishap rate, and a better customer image of aviation professionalism.

—CW4 Dale A. Miller, Safety/Operations Officer, SHAPE Flight Detachment, Chievres AB, Belgium, DSN 361-5544

Three strikes, you're out!

Better pilots than I have often told me about a preflight procedure in which mission cancellation is considered when three or more significant deficiencies are found. I once had a chance to apply that advice. However, in the spirit of "mission accomplishment," I did not—with almost disastrous results.

I was a warrant officer at the time and new to the Black Hawk, having just transitioned from Cobras. After progressing to RL1 day and night, I had already tucked a few missions under my belt and was feeling pretty good about my new aircraft. After receiving a mission with a new PC, I was excited; my IP and the commander were showing confidence in me.

The strike sequence began when we received our mission. The mission was at night, and I had not yet begun my NVG progression. Low light levels made matters worse. Strike one.

During preflight, we discovered that the VHF radio was inop, leaving us with only the UHF radio for air traffic control. Strike two.

Perhaps an inoperative radio was enough to cancel the mission when combined with unaided flight at night in low light. But we didn't cancel.

Then we checked the weather. Although legal, conditions were marginal at best. Strike three.

I know what you're thinking; we would be crazy to depart. Two relatively inexperienced pilots on a night unaided mission under low light conditions, marginal VMC, and only one radio.

Our mission was simple: Travel clockwise around the reservation and insert a squad into an LZ. With 10 soldiers on board, we departed to the west. After turning to the north, the weather started getting worse, so I began flying lower. At this point, I finally started feeling uncomfortable and said so. The PC said it was not bad enough to cancel and to continue on, so we did.

The farther north we went, the worse the weather became. I turned to the east to follow our route, and out of nowhere came a solid wall of fog. I banked hard to the right to avoid the fog, momentarily entering it. We came out in a dive that I pulled out of just prior to entering the trees.

That was when the PC and I decided to take our passengers back to the PZ and return to base.

I couldn't see the PZ because it was out our left door and I was in the right seat, so I transferred the controls to the PC. As he initiated the turn, he inadvertently ascended into the clouds. We finally got smart and committed to IFR. Feeling the sharp increase in our rate of ascent, the soldiers in the back made it known that they were having a great time, oblivious to what was going on in the cockpit.

We contacted our flight-following agency and told them our status. The controller gave us a VHF frequency for radar control. We, however, did not have a VHF radio, so after a short delay he gave us a UHF frequency.

The stress in the controller's voice was evident when he realized our situation. We were at 3,500 feet as we started receiving vectors for downwind. We were in inadvertent IMC. It couldn't get any worse, right?

Wrong.

As our crew chief dug for the approach plate, our UHF radio started going intermittent. Then, for what seemed like a very long time, it was totally silent—and, oh, by the way, our fuel was getting low. Finally, our radio crackled back to life, and we made a safe landing.

We had completed a risk assessment for this mission, but, because we didn't take it far enough, it did not tell the whole story.

Mission accomplishment was so important that it clouded our judgment. We put not only the crew but also our passengers in a dangerous situation.

As professional aviators, we have a responsibility to our passengers and to ourselves to apply sound risk management. We had completed a risk assessment for this mission, but, because we didn't take it far enough, it did not tell the whole story. We had looked at each "strike" separately; had we considered their cumulative effects, we probably would have done things a lot differently.

That's the whole idea behind the three-strike rule: Small problems combined with other small problems can turn into big trouble quick!

Looking back on this mission, I wonder: What in the world was I thinking?

—2LT Shannon D. McAteer, A Company, 603d Aviation Support Battalion, Hunter AAF, GA 31409, DSN 971-2782 (912-353-2782)

Rescue hoists: A resurgence of past problems?

Since I've been assigned to the Safety Center, I've reviewed reports of mishaps involving rescue-hoist operations. Several factors became obvious: lack of written standards and operating procedures, lack of or inadequate maintenance procedures, and lack of standards for conducting hoist operations. One recent case involved improper installation of the wrong cable assembly. Five different standards were identified for performing pre-operational checks on the hoist. Another involved cable shearing. And the Army is not the only organization with hoist problems. The Air Force just issued a restriction on live training missions because of cable failures on the Breeze Eastern external hoist. These examples reinforce the need to establish, train, and maintain to standard.

We've done well in keeping the hoist accident rate low over the years, but it appears we are taking a step backwards—a step back to a time when we killed and injured soldiers and civilian emergency personnel during hoist operations.

Units with rescue hoists on their property books must stop and review their hoist-operation procedures. Unit leaders should ensure they have a written qualification and training (ATM) standard, review the individual training and experience of those operating the hoists, and designate a unit trainer to oversee individual and crew operational training.

Once these reviews are completed and all factors have been brought to standard, units should look at who's doing the maintenance. If your maintenance is being done by a contractor, are the contractor personnel trained and qualified to maintain your hoists to Army standard? Are your military maintenance personnel trained and qualified to maintain your hoists to Army standard? This is where the unit trainer comes in. Unit trainers must also be involved in maintenance to ensure Army standards are maintained.

When it comes to hanging from a hoist, no matter how close to the ground, you must have the confidence that comes from knowing that all aspects of hoist maintenance, inspection, operation, and in-flight procedures are done to Army standards. If they're not, chances are someone will get hurt at some point.

Let's take a positive, proactive approach to the business of rescue-hoist maintenance, operations, and training. Bring your hoists out of the CONEX. Get them out of the shipping boxes. Get them inspected and brought up to serviceable condition. Get your people involved, and above all, get them trained to standard. You'll see your rescue-hoist operations take on a new air of confidence. Your people will take pride in knowing that their equipment can be called on any time, any where to get the job done. Remember the bottom line: Get in. Get 'em out. Do it safely. Do it to standard. Do it with confidence in your equipment.

—MSG Will Bauer, USASC Force Development/Force Projection Branch, DSN 558-2959 (334-255-2959)

ShortFAX

Keeping you up to date

New slingload requirements

FM 10-450-3 currently requires that all slingloads be inspected by a certified inspector. After 1 October 1997, all personnel whose jobs involve slingload requirements must have attended a certification course and qualified as an inspector.

The Army Slingload Inspection Certification (SLIC) Course is available to all services at Fort Lee, VA. For information, contact the Slingload Office, Inspector Certification Course, Airborne and Field Services Department, U.S. Army Quartermaster Center and School, Fort Lee, VA 23801-1501, DSN 687-4185 (804-734-4185).

E-mail for ALSE info

The U.S. Army Aeromedical Research Laboratory has established a new e-mail address for the following:

- Aviation Life Support Equipment Retrieval Program (ALSERP) issues from accident investigators.
- ALSE equipment compatibility and injury concerns.
- Helmet-fitting questions and coordination of Lab visits to resolve helmet-fitting issues.

The e-mail address is ALSERP@RUCKER-EMH2.ARMY.MIL. You may also call DSN 558-6895/6893 (334-255-6895/6893).

GG-rotor-replacement update

The UH-60 T700-GE-700 engine change-out began on 4 November and is scheduled to be completed by 31 March 1997. As of early January, General Electric had replaced about 200 of the estimated 380 undampened GG rotors.

The AH-64A GG-rotor contract was awarded on 20 December to replace T700-GE-701 engines with undampened GG rotors. The contractor is required to supply 50 GG rotors per month, and on-site change-out will begin this quarter. The program is expected to last for about 16 months and will follow the DCSOPS-approved fielding schedule. Replacement schedules will be coordinated between the replacement team and affected units. USAREUR and the Netherlands units are first priority.

UH-60 POC is Mr. Dave Lizotte, DSN 693-0485 (314-263-0485); AH-64 POC is Mr. Bill Reese, DSN 693-6794 (314-263-6794).

Accident briefs

Information based on *preliminary* reports of aircraft accidents

AH1

Class E

F series

■ While hovering for takeoff at night, master caution and alternator rectifier segment lights came on. Aircraft was shut down and mission was canceled. Maintenance replaced alternator control unit.

■ During engine runup, crew increased throttle to 100-percent N2. Upon reducing throttle to ground idle, crew chief noticed fuel manifold was leaking. Aircraft was shut down, and maintenance replaced fuel manifold assembly.

■ Master caution and engine chip detector lights came on in cruise flight at night at 1800 feet agl. About 15 seconds later, the engine failed. Aircraft was autorotated and landed without incident in passing lane of interstate highway. Cause of engine failure not reported.

AH64

Class C

A series

■ While applying full forward cyclic in cruise flight at 800 feet agl, crew heard loud pop and noted damage to PNVS and WSPS. Upon shutdown, additional damage to three main rotor blades was noted.

Class D

A series

■ While in formation flight at 500 feet agl and 120 KIAS at night, aircraft hit bird. Impact caused main transmission access fairing to bend backward and cover No. 1 engine nose gearbox. Crew was unaware of the bird strike until an hour later when the gearbox caution/warning light came on.

Class E

A series

■ TADS/FLIR failed after 15 minutes of cruise flight. Aircraft returned to home base, where maintenance repaired TADS turret. MOC was okay, and aircraft was released for flight.

■ During takeoff to a hover, PC noticed engine oil pressure fluctuating between 22 and 40 psi. Aircraft was shut down without incident. Maintenance replaced HMU seal.

■ During approach to airfield at 300 feet and 20 KIAS, chips main transmission caution warning segment light came on. Crew continued approach and landed without damage. Metallic fragments were found on chip detector; transmission was replaced.

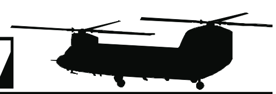
■ Pilot's ICS was intermittent during runup. Maintenance replaced pilot's ICS cable.

■ No. 2 generator light came on during NOE flight. Generator was reset with no response. Aircraft returned to home station, where maintenance replaced generator.

■ APU failed after 25 minutes of operation during runup. APU was restarted but failed again after 5 minutes. APU was replaced and aircraft released for flight.

■ No. 2 engine would not start (air turbine starter failed). Maintenance replaced No. 2 engine air starter due to broken shaft. MOC okay.

CH47



Class B

D series

■ **Aircraft-ground accident.** About 45 minutes into flight following deck landing qualification, aircraft was at 10 feet agl and 120 knots when aft blade pitched 20 degrees. Crew disengaged heading hold and regained blade control with aft cyclic input and continued flight for 2.5 hours. On engine shutdown, yellow aft blade contacted forward yellow blade and No. 2 tunnel cover. Inspection revealed that bracket holding blade damper had separated and kevlar windings had broken. Further inspection revealed that kevlar windings in damper brackets in remaining two aft blades had loosened.

Class C

D series

■ **Flight related.** External load was inadvertently jettisoned from 75 feet on short final to landing zone during multi-ship NVG external-load operations. CE calling the load pressed the cargo-release button instead of the microphone switch on the hoist operator control grip, jettisoning the load. Aircraft executed a go-around and landed about 100 meters behind the load, an M998 HMMWV. Damage was limited to the M998.

Class E

D series

■ At 10-foot hover during multi-ship NVG external-load operations, crew-member calling the load allowed aircraft to descend too low. M119 howitzer's gun tube struck bottom of aircraft just forward of right forward landing gear. Inspection revealed sheet metal damage to bottom of aircraft.

■ At 2000 feet and 140 knots, left escape hatch fell off. Crew felt no impact to aircraft or rotor system, and no vibration increase was noted. Postflight inspection revealed no damage.

■ While aircraft was on the ground with engines running, No. 1 vertical gyro indicator malfunctioned and showed a 30-degree left bank. No caution lights came on. No. 1 VGI worked in the emergency position. Aircraft was shut down and turned over to maintenance, but problem could not be duplicated.

■ Aircraft was straight and level at 2500 feet msl on instrument approach when loud groaning noise was heard in forward transmission area. Less than 15 seconds later, a severe lateral airframe vibration began. Precautionary landing was made immediately and vibration was still present after landing. Emergency shutdown was performed. Vibration was caused by faulty No. 1 flight hydraulic pump.

■ No. 1 engine went high side during hover. Crew controlled rotor rpm with thrust and ECL during return to airfield and landed without incident. MOC could not duplicate, and aircraft was released for flight.

OH58

Class B

A series

■ Engine failed during OGE hover at 500 feet. Aircraft descended into trees.

D series

■ During NVG training mission, aircraft drifted rearward and down, and tail rotor hit tree.

Class C

D series

■ Crew detected burning odor about 40 minutes into third leg of four-leg flight. Shortly thereafter, a.c. generator failed and crew noticed traces of smoke in the cockpit. Associated components sustained collateral damage.

■ Tail rotor and associated gearbox separated at rivet points during maintenance test flight. Aircraft landed hard and tail boom separated. Location of gearbox separation had been identified for repair.

Class E

A series

■ PC noticed binding in collective during HIT check. Aircraft was returned to parking without incident. Electrical clamp was found chaffing on collective dust boot housing. Housing was cut away to allow free movement of collective.

D series

■ Throttle was opened at 12 percent during engine start. Engine did not light off until 16 percent, accompanied by rapid rise in tgt. Start was aborted and tgt gauge readings indicated max temperature of 896°C was reached. Check of engine monitor page indicated max temperature of 940°C was reached.

■ After battery switch was on for 1 minute, caution light came on. Maintenance replaced battery.

■ Small hole was found on leading edge of tail rotor blade during postflight. Blade was replaced. Suspect damage was caused by rocks during operations in unimproved areas.

■ During OGE hover, IP and PI noticed vertical vibration. Main rotor hub assembly was replaced.

■ Single red segment light on engine oil temperature vertical scale came on during low-level flight. Maintenance replaced thermo-bulb valve.

UH1

Class C

H series

■ During cruise flight at 5500 feet msl and 100 KIAS, aircraft yawed left, N2 decayed, and rpm light and audio came on. IP took controls and lowered collective. N1 was fluctuating at about 80 percent. IP increased collective and rotor rpm decayed to 260 rpm. IP again lowered collective and instructed PI to place governor switch to emergency position. IP adjusted throttle and again increased collective, resulting in rotor rpm decay. As IP performed autorotative landing to narrow asphalt road, main rotor blades struck small tree branches, causing dents in bottom of blades. Cause of engine failure not reported.

Class D

V series

■ Aircraft landed hard during NVG blowing-snow landing to unimproved area. Touchdown was normal and smooth, but, while skiing forward, aircraft pitched up and then down sharply before coming to complete stop in a 5-degree nose-low attitude. Aircraft was inspected in deep snow and no damage was observed. After landing at home station for refueling, aircraft was sitting unusually low and was shut down and reinspected. This inspection revealed damage to front cross tube, right cross tube tunnel, and lower WSPS tip.

UH60

Class C

A series

■ PI applied excessive aft cyclic during final phase of blowing-snow approach. As flight continued for pinnacle approach, IP noted lateral vibrations. Aircraft returned to base and was shut down without incident. Postflight inspection revealed that main rotor blades had contacted intermediate drive-shaft cover. One main rotor blade, two tip caps, and intermediate drive-shaft cover were damaged.

Class E

A series

■ During cruise flight, PC noticed burning odor. Crew chief then noticed electrical sparks coming from behind copilot's head. PC turned off auxiliary cabin heater, which had not been used in several months, and sparks subsided. Postflight inspection revealed that 20-gauge wire attached to ESSS support bar was chaffing, causing the sparks. Wiring was replaced.

■ After departure with slingload, fire lights on master caution panel and No. 2 emergency "T" handle came on. No fire was seen. Postflight inspection revealed lower fire detector sensor had water in it. Sensor was replaced.

■ During shutdown, SP inadvertently moved fire extinguisher switch to main while moving air source switch to APU. None of the fire "T" handles were armed. CE saw puff of black smoke from APU exhaust. After shutdown, inspection of fire bottles showed one had 0 psi while the other indicated 550 psi. No evidence of extinguishing agent was found in any compartment. Suspect that bottle charging agent leaked out prior to flight. Bottle was replaced.

C12

Class C

C series

■ During short final for landing, IP announced "power," and RSP reduced power. Aircraft touched down hard. Visual inspection revealed no damage, but subsequent crew noted wrinkling in fuselage. ECOD pending.

Class E

C series

■ While aircraft was passing through 8500 feet on climbout, loud whistling sound emanated from cabin area. Crew determined that air was leaking around emergency exit window. Maintenance found that seal was not seated properly.

D series

■ At 5500 feet during climb to cruise altitude, pilot saw flock of geese and made evasive maneuver to avoid bird strike. Although crew saw or heard nothing to indicate bird strike had occurred, postflight inspection revealed 6-inch-long, ½-inch deep dent in leading edge of right wing immediately outboard of nacelle tank.

■ During runup, left engine torque gauge dropped to zero as power lever was increased. Maintenance determined that torque gauge cannon plug wire had become disconnected.

F series

■ Aircraft was refueled after landing from routine service mission. Upon startup for departure, right auxiliary fuel gauge registered zero with a load of 250 pounds. Maintenance replaced fuel probe.

■ Crew heard loud thump during approach to home station at night. Bird-strike damage was discovered during postflight inspection.

G series

■ During IFR flight at 21,000 feet and 175 knots, lightning struck aircraft.

For more information on selected accident briefs, call DSN 558-2785 (334-255-2785).

Aviation messages

Recap of selected aviation safety messages

Aviation safety-action messages

AH-1-97-ASAM-01, 171600Z Dec 96, maintenance mandatory.
UH-1-96-ASAM-01 required replacement of all UH-1 main drive shaft clamp bolts and established a mandatory phase inspection replacement for those bolts. At the time of the original ASAM, the bolt was thought have failed due to fatigue because of its age. Subsequent analysis indicates that the fatigue was caused not by age but from a machining mark on the bolt head-to-shank radius that exceeds allowable surface-finish requirements for this part. The purpose of this message is to require replacement of drive shaft clamp bolts (P/N 204-040-624-1, NSN 5306-00-724-3593) exhibiting the marking "SV" on all UH-1H/V and AH-1 aircraft, purge these bolts from supply, and eliminate the previously implemented phase inspection replacement of these bolts on the UH-1H/V. ATCOM contact: Mr. Jim Wilkins, DSN 693-2258 (314-263-2258).

CH-47-97-ASAM-01, 101555Z Oct 96, maintenance mandatory.
CCAD announced a recall of certain forward synchronizing drive shaft assemblies. The purpose of this ASAM is to require a one-time records check and visual verification of all 145D3400-23/25/32 forward synchronizing drive shaft assembly data plates for suspect serial numbers. ATCOM contact: Mr. Jim Wilkins, DSN 693-2258 (314-263-2258).

CH-47-97-ASAM-02, 301923Z Dec 96, maintenance mandatory.
Several reports have been received of inadvertent release of an external load due to inadvertent actuation of the cargo hook release switch. The purpose of the message is to fabricate and install a plastic cargo hook release switch guard on the winch/hoist operators control grip assembly. ATCOM contact: Mr. Jim Wilkins, DSN 693-2258 (314-263-2258).

UH-1-97-ASAM-01, 171600Z Dec 96, maintenance mandatory.
See AH-1-97-ASAM-01 above.

UH-60-97-ASAM-04, 191631Z Dec 96, maintenance mandatory.
The retirement life of the main rotor blade cuff manufactured by Fenn Manufacturing had been adjusted several times as a result of preliminary test results. The purpose of this message is to permit the Fenn cuff to be operated to its full life of 2400 hours (500 hours for the MH-60K) due to engineering testing results. ATCOM contact: Mr. Jim Wilkins, DSN 693-2258 (314-263-2258).

UH-60-97-ASAM-05, 301341Z Dec 96, maintenance mandatory.
Certain viscous damper bearing support assemblies (P/N 70361-05060-042) have been found to be defective. The purpose of this message is to require inspection for subject assemblies manufactured by Laumann Manufacturing and to remove them at the next 100-hour inspection. ATCOM contact: Mr. Jim Wilkins, DSN 693-2258 (314-263-2258).

GEN-97-ASAM-02, 060655Z Nov 96, operational.
In June 1995, restrictions were placed on firing certain 2.75-inch hydra-70 rockets from AH/MH-6, MH-60, AH-1, AH-64A/D, and OH-58D aircraft. The purpose of this message is to rescind GEN-95-ASAM-04, 021818Z Jun 95, and also to require reporting of MK-66 incidents to ATCOM directly. ATCOM contact: Mr. Howard Chilton, DSN 693-1587 (314-263-1587).

GEN-97-ASAM-03, 302019Z Dec 96, operational.
Problems involving corrupted data have been reported with some global positioning system (GPS) receivers. The purpose of this message is to require inspection of all CH-47D, UH-60, Special Operations Aircraft (SOA), and Special Electronics Mission Aircraft (SEMA) for type of GPS receiver installed and to change operational procedures for loading crypto keys in AN/ASN-149 GPS receivers. ATCOM contact: Mr. Jim Wilkins, DSN 693-2258 (314-263-2258).

Safety-of-flight message

CH-47-97-SOF-01, 141510Z Nov 96, technical.
Two safety-of-flight messages issued in April 1990 required inspection for and replacement of certain barrel nuts manufactured by Hartford Aircraft Products, Inc. A report was just received that another barrel nut manufactured by this vendor has been found, suggesting that additional discrepant nuts may be installed on H-47 Chinooks. The purpose of this message is to require another one-time visual inspection of forward transmission NAS577B20A mounting (barrel) nuts on all CH-47D, MH-47D, and MH-47E aircraft prior to next flight and removal of nuts manufactured by Hartford Aircraft Products, Inc. They can be identified by an impression stamp marking of HAP or cage code 66861 on the exposed barrel nut carrier. ATCOM contact: Mr. Jim Wilkins, DSN 693-2258 (314-263-2258).

Maintenance-information messages

AH-64-MIM-97-03, 121340Z Dec 96.
There have been a number of failures of the pilot and CPG cyclic housings in the lateral portion where the MS20066-77 keys are installed. The keyway may become loose, causing the DASE roll channel to disengage intermittently during control inputs with force trim on. It is also possible that a loose keyway may cause a slight lateral drift in a hover. The purpose of this message is to outline procedures to correct the problem. ATCOM contact: Mr. Ken Muzzo, DSN 490-2257 (314-260-2257).

OH-58-MIM-97-01, 311606Z Oct 96.
Change 24 to TM 55-1520-228-23-1, 31 Aug 96, erroneously placed a 600-hour retirement interval on certain engine parts on all OH-58A/C aircraft. The purpose of this message is to remove the 600-hour retirement interval and substitute "on condition" in the overhaul interval column. ATCOM contact: Mr. Stephen P. Dorey or Mr. Rusty Reed, DSN 490-2258/2697 (314-260-2258/2697).

GEM-MIM-97-02, 171451Z Dec 96.
Adjustment procedures in TM 11-5895-1037-12&P for the AN/APX-100(V) IFF transponder have been found to be incomplete and misleading and may significantly degrade operation of the system. The purpose of this message is to outline procedures to correct the problem. ATCOM contact: Mr. Stephen Sekach, DSN 693-5580 (314-263-5580).

Messages: What's the difference?

Messages. We get all kinds. We get safety-of-flight messages; we get safety-action messages; we get safety-of-use messages; we get safety alert messages. While they're all important, some are more important than others. So it's good to review their purposes every once in a while.

Here goes.

Safety-of-flight messages

SOF messages pertain to any actual or potential defect or hazardous condition that could cause injury to personnel or damage to aircraft, components, or repair parts. They may also authorize immediate use of technical changes to publications pending receipt of the DA-authenticated change. There are four types of SOF message:

- **Emergency:** Used for grounding purposes only. Immediately grounds a fleet or a designated portion of a fleet when a hazardous condition exists that has the potential to cause a catastrophic accident.
- **Operational:** May ground aircraft for other than emergency reasons to correct hazardous conditions relating to aircraft operations. These may include flight procedures, operating limitations, or operational policy.
- **Technical:** May be issued to effect noncatastrophic grounding for materiel or maintenance conditions. Messages include corrective action not involving configuration changes; aircraft, component, or repair-parts modification; one-time inspection requirements; or long-term replacement of safety-related items that require continuous monitoring.
- **Maintenance mandatory:** Will not ground aircraft but may require accomplishment of a task and require a report of completion or findings.

The proponent for SOF messages is the ATCOM Material Safety Office, DSN 693-2933.

Aviation safety-action messages

ASAMs pertain to any defect or hazardous condition, actual or potential, that can cause injury to personnel or damage to aircraft, components, or repair parts. They may also authorize immediate use of technical changes to publications announced in the message pending receipt of the DA-authenticated change. ASAMs are of lower priority than SOF messages. There are three types of ASAM:

- **Maintenance mandatory:** Directs maintenance actions and/or updates technical manuals; may call for compliance reporting.
- **Informational:** Provides status and information of a maintenance, technical, or general nature.
- **Operational:** Pertains to aircraft operations and flight procedures, limitations, or operational policy.

The proponent for ASAMs is ATCOM Material Safety Office, DSN 693-2933.

Safety-of-use messages

SOU messages for aviation-associated equipment pertain to any defect or hazardous condition, actual or potential, that can cause injury to personnel or damage to nonaircraft equipment such as aircraft ground-support and ancillary equipment. There are four types of SOU messages for aviation-associated equipment:

- **Operational:** Changes operating procedures or places limits on equipment use.
- **Technical:** Deadlines equipment used in support of aircraft or other aviation-associated equipment because of materiel or maintenance deficiencies and for modification of the equipment or its components.
- **One-time inspection:** Immediately deadlines equipment and directs inspection prior to next use and maintenance/modification to correct identified hazard or deficiency.
- **Advisory/technical maintenance or operational:** Contains new operational or technical maintenance information.

The proponent for SOU messages for aviation-associated equipment is ATCOM Material Safety Office, DSN 693-2933.

Safety-alert messages

SAMs are issued to notify users of existing and ***potential*** hazardous conditions identified during the course of an accident investigation. The proponent is the Army Safety Center's Operations Office, DSN 558-3410/2660.

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Class A Accidents

through December

		Class A Flight Accidents		Army Military Fatalities	
		96	97	96	97
1ST QTR	October	1	0	0	0
	November	0	0	0	0
	December	0	1	0	0
2D QTR	January	1		0	
	February	0		0	
	March	2		7	
3D QTR	April	1		3	
	May	0		0	
	June	1		6	
4TH QTR	July	0		0	
	August	0		0	
	September	1		0	
	TOTAL	7	1	16	0

U.S. ARMY SAFETY CENTER

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Thomas J. Konitzer
Brigadier General, USA
Commanding General